

CLAIMS

1. A method for identifying a test agent as reducing apoptosis of a macrophage cell comprising:

- 5 (a) providing:
- (i) macrophage cells; and
- (ii) a test agent; and
- (b) contacting said macrophage cells in the presence of said test agent to produce contacted macrophage cells and in the absence of said test agent to produce control
- 10 cells; and
- (c) detecting reduced activity of Protein Kinase R in said treated cells compared to Protein Kinase R in said control cells, wherein said detecting identifies said test agent as reducing apoptosis of macrophage cells.

15 2. A method for identifying a test agent as reducing apoptosis of macrophage cells, comprising:

- (a) providing:
- (i) macrophage cells; and
- (ii) a test agent;
- 20 (b) contacting said macrophage cells in the presence of said test agent to produce contacted macrophage cells and in the absence of said test agent to produce control cells; and
- (c) detecting reduced activity of Toll-like Receptor-4 in said treated cells compared to Toll-like Receptor-4 in said control cells, wherein said detecting
- 25 identifies said test agent as reducing apoptosis of macrophage cells.

3. The methods of Claim 1 and Claim 2 further comprising, d) identifying said test agent as anti-bacterial.

30 4. A method for reducing apoptosis of macrophage cells, comprising reducing the activity of a Protein Kinase R.

5. A method for reducing apoptosis of macrophage cells, comprising reducing the activity of a Toll-like Receptor-4.

6. A method for reducing apoptosis of macrophage cells, comprising:

(a) providing:

(i) macrophage cells; and

(ii) an agent that reduces activity of Protein Kinase R; and

(b) contacting said macrophage cells with said agent under conditions such that said agent reduces activity of said Protein Kinase R.

7. A method for reducing apoptosis of macrophage cells, comprising:

(a) providing:

(i) macrophage cells; and

(ii) an agent that reduces activity of Toll-like Receptor-4; and

(b) contacting said macrophage cells with said agent and without said agent under conditions such that said agent reduces activity of said Toll-like Receptor-4.

8. The method of Claim 6, wherein said macrophage cells are contacted with a molecule chosen from one or more of lipopolysaccharide, lipoteichoic acid, *Yersinia pseudotuberculosis* YopJ protein, and protein expressed by the *Salmonella typhimurium* SPI2 locus.

9. The method of Claim 6, wherein said macrophage cells are contacted with a bacterium.

10. The method of Claim 9, wherein said bacterium is gram-negative.

11. The method of Claim 10, wherein said gram-negative bacterium is one or more of *Yersinia species*, *Salmonella typhimurium*, and *H. influenza*.

12. The method of Claim 9, wherein said bacterium is gram-positive.

13. The method of Claim 12, wherein said gram-positive bacterium is a *B. anthracis*.

14. The method of Claim 6, wherein said macrophage cells are contacted with one or more of dsRNA and virus prior to contacting with a molecule chosen from one or more of lipopolysaccharide, lipoteichoic acid, *Yersinia pseudotuberculosis* YopJ protein, and protein expressed by the *Salmonella typhimurium* SPI2 locus.

15. The method of Claim 6, wherein said macrophage cells are contacted with one or more of dsRNA and virus prior to contacting with a bacterium.

16. The method of claim 13, wherein said virus comprises *Influenza virus*.

17. A method of treating a microbial infection in a cell, comprising:
a) providing:

- i) a cell with one or more symptoms of a microbial infection and
- ii) a formulation comprising a Protein Kinase R inhibitor; and

b) administering said formulation to said cell under conditions such that said one or more symptoms of a microbial infection are reduced.

18. The method of Claim 17, wherein said cell has a microbial infection associated with one or more symptoms of a viral infection.

19. The method of Claim 17, wherein said microbe is a bacterium.

20. The method of Claim 19, wherein said bacterium is selected from a group comprising *Bacillus species*, *Yersinia species*, *Salmonella species*, *Shigella species*, *Streptococcus species* and *Haemophilus species*.

21. The method of Claim 18, wherein said virus is selected from a group comprising *Influenzavirus A*, *Influenzavirus B*, and *Influenzavirus C*.

22. The method of Claim 17, wherein said infection is a multiple infection.

23. The method of Claim 22, wherein said multiple infection comprises a bacteria infection and a virus infection.

5 24. The method of Claim 23, wherein said virus is selected from a group comprising *Influenzavirus A*, *Influenzavirus B*, and *Influenzavirus C*.

25. The method of Claim 17, wherein said cell is in a patient.

10 26. The method of Claim 25, wherein said patient comprises one or more of an animal and a human.

26. The method of Claim 25, wherein said patient has a microbial infection associated with one or more symptoms of a viral infection.

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27. A method of treating a microbial infection in a patient, comprising:

a) providing:

i) a patient with one or more symptoms of a microbial infection and

ii) a formulation comprising a Protein Kinase R inhibitor; and

20 b) administering said formulation to said patient under conditions such that said one or more symptoms of a microbial infection are reduced.

28. The method of Claim 27, wherein said patient has a microbial infection associated with one or more symptoms of a viral infection.

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29. The method of Claim 18, wherein said infection is a bacterial infection.

30. The method of Claim 29, wherein said bacterium is selected from a group comprising *Bacillus species*, *Yersinia species*, *Salmonella species*, *Shigella species*,
30 *Streptococcus species* and *Haemophilus species*.

31. The method of Claim 28, wherein said virus is selected from a group comprising

Influenzavirus A, Influenzavirus B, and Influenzavirus C.

32. The method of Claim 27, wherein said infection is a multiple infection.

5 33. The method of Claim 32, wherein said multiple infection comprises a bacteria infection and a virus infection.

34. The method of Claim 33, wherein said virus is selected from a group comprising *Influenzavirus A, Influenzavirus B, and Influenzavirus C.*

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